

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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William Ferrel.

1817—1891.

IN PROFESSOR FERREL it is not merely the meteorologists of the United States who have sustained the loss of one of their deepest thinkers, the science generally is weakened by his loss. We were going to say that Ferrel was a self-made man, but that is scarcely the term to apply to a man whose innate genius being recognised by his countrymen, was by them almost compelled to accept appointments which he did not seek. The extremely mathematical point from which he viewed every subject, rendered many of his works quite beyond the comprehension of ordinary readers, and even when, as in his "Popular Treatise on the Winds," and his "Popular Essays on the Movements of the Atmosphere," he tried to write down to a lower level, it was evidently difficult for him to do so. Ferrel's work was in the fundamentals of meteorology; and just as the finest bridge will fail if the foundations are not well laid, and yet the ordinary public look only on the superstructure, so the name of Ferrel is by no means as well known as that of many who have built upon his foundations. We are not sure that anyone knows even yet how much is due to the man who, born as a farmer's boy, died a Member of the National Academy of Sciences, one of the 16 Honorary Fellows of the Royal Meteorological Society, one of the 15 Ehrenmitglieder of the Oesterreichischen Ges. für Meteorologie, and one of the 18 Ehrenmitglieder of the Deutschen Meteor. Gesellschaft.

## UNDERGROUND TEMPERATURE.

*Die Bodentemperaturen an der K. Sternwarte bei München und der Zusammenhang ihrer schwankungen mit den Witterungsverhältnissen.*

Von DR. KARL SINGER. Ackerman, München, 1890. 4to, 24 pages, 1 plate.

AN interesting and well-worked-up summary of the results of the earth thermometers at Munich during the 29 years, 1861 to 1889.

The principal results are :—

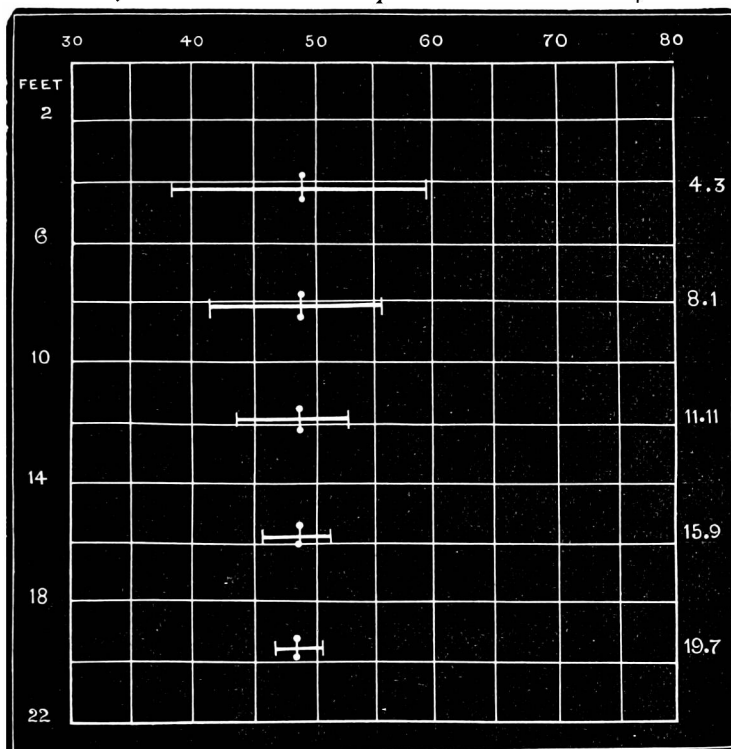
| Depth.  | Temperature. |      |      |        | Average Dates. |              |
|---------|--------------|------|------|--------|----------------|--------------|
|         | Mean.        | Min. | Max. | Range. | Minimum.       | Maximum.     |
| ft. in. | °            | °    | °    | °      |                |              |
| 4 3     | 48·5         | 38·2 | 59·3 | 21·1   | March 2        | August 24    |
| 8 1     | 48·5         | 41·6 | 55·6 | 14·0   | „ 27           | September 12 |
| 11 11   | 48·4         | 43·7 | 53·1 | 9·4    | April 13       | October 7    |
| 15 9    | 48·4         | 45·3 | 51·6 | 6·3    | May 3          | „ 25         |
| 19 7    | 48·3         | 46·2 | 50·3 | 4·1    | „ 23           | November 17  |

These values will be better understood if shown on a diagram—and (as indicating how generally accordant are observations of this class) we give the diagram exactly on the same scale as one representing the Greenwich earth temperature in 1874, in the *Quar. Jour. Met. Soc.*, Vol. III., p. 422. We have, however, added another with two lines, which may perhaps be original—it is rarely safe to say that anything is so. The lines join the dates of minimum and of maximum at the respective depths, and they show how harmoniously the diminution in the range of temperature, and the retardation in the date of occurrence of the extremes, proceed. In fact, subject to future correction, we think that it may be accepted as approximately true, that for each foot of depth the minimum and the maximum are each retarded 5 days. Take for instance these Munich values, and for convenience take them as even depths of 4 ft. (they are really 3 ft. 10 in.) each, then we have 20 days retardation for each 4 feet (16½ days for each metre).

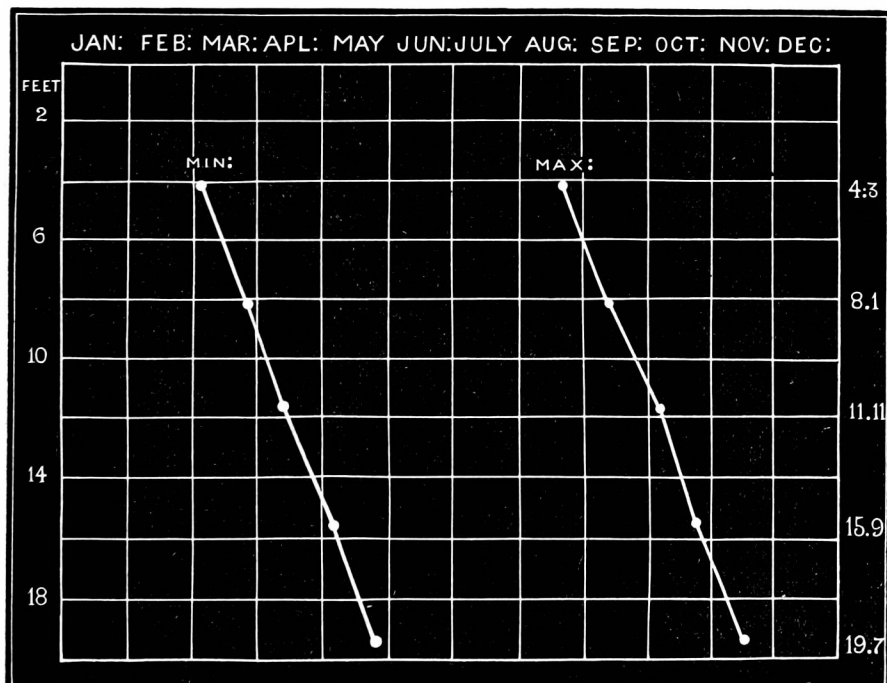
| Depth.     | MINIMUM.  |           |        | MAXIMUM.  |          |        |
|------------|-----------|-----------|--------|-----------|----------|--------|
|            | Observed. | Computed. | Error. | Observed. | Computed | Error. |
| 4 ft. ...  | March 2   | ...       | —      | Aug. 24   | ...      | —      |
| 8 ft. ...  | „ 27      | March 22  | — 5    | Sept. 12  | Sept. 13 | + 1    |
| 12 ft. ... | April 13  | April 11  | — 2    | Oct. 7    | Oct. 3   | — 4    |
| 16 ft. ... | May 3     | May 1     | — 2    | „ 25      | „ 23     | — 2    |
| 20 ft. ... | May 23    | May 21    | — 2    | Nov. 17   | Nov. 12  | — 5    |

From this we further see that the minimum and the maximum will be each six months late—i.e. the minimum will occur shortly after midsummer, and the maximum shortly after midwinter, at a depth of about 37 ft., and the deepest observations yet regularly taken accord very fairly with that theory.

*Min., Mean and Max. Temperatures at various depths.*



*Retardation of Date of Min. and of Max. Temperatures with increasing depth.*



Just for the sake of curiosity we have taken Prof. Everett's excellent discussion of the Greenwich earth temperatures, and applied the same rule to them. The following are the results :—

| Depth.     | MINIMUM.  |           |        | MAXIMUM.  |           |        |
|------------|-----------|-----------|--------|-----------|-----------|--------|
|            | Observed. | Computed. | Error. | Observed. | Computed. | Error. |
| 1 in. ...  | Jan. 24   | ...       | —      | July 26   | ...       | —      |
| 3 ft. ...  | Feb. 8    | ...       | 0      | Aug. 9    | ...       | + 1    |
| 6 ft. ...  | " 24      | ...       | — 1    | " 25      | ...       | 0      |
| 13 ft. ... | Mar. 27   | ...       | + 3    | Sept. 25  | ...       | — 6    |
| 26 ft. ... | June 1    | ...       | + 2    | Nov. 30   | ...       | — 7    |

Therefore both at Munich and at Greenwich 5 days retardation for each foot of depth is right within 2 per cent.

It will be noticed that the mean temperature decreases as greater depths are reached about  $0^{\circ}2$  for 20 ft. ; we do not understand this. A still greater decrease is shown by the Greenwich observations, but thousands of observations all the world over prove that the temperature of the earth increases as we penetrate its crust. We have devoted some time to tabulating and plotting three long series of observations—Adelaide 21 years, Sydney 17 years and Melbourne 15 years—and the result is to confirm our dislike of the old pattern of earth thermometer, and to induce us to believe that the sooner new pattern thermometers, the index errors of which can be verified from time to time, are put down by the side of the present ones, the better. It would seem preposterous to give the index errors of thermometers buried in the soil on the other side of the globe ; we therefore merely ask our Australian friends to put down fresh thermometers, and so test their old ones. We have no doubt whatever that if the Greenwich authorities did so, the decrease they now state to exist would be reduced, if not converted into an increase. Surely no one will now defend the use of thermometers the accuracy of which cannot be verified.

## REVIEW.

*Meteorologische Volksbücher. Ein beitrage zur Geschichte der Meteorologie und zur Kulturgeschichte.* Von PROF. DR. G. HELLMANN. H. Paetel, Berlin, 1891, large 8vo, 53 pages.

DR. HELLMANN is probably the highest living authority on Meteorological literature, and in this little work we have not merely accounts of some of the very earliest printed books upon meteorology, but also critical and explanatory notes by a master hand.

We, of course, cannot translate all these 53 large pages and transfer them to our own, for it would fill several numbers, and yet we believe that they would be of considerable and wide-spread interest.

Dr. Hellmann goes back to—indeed, in many cases beyond—the invention of printing, and shows how the popular treatises upon meteorology current in Germany four hundred years ago, were based upon still earlier manuscripts. He devotes naturally much attention to the “Book of Nature,” the oldest treatise on Natural History written

in German. It was written by Konrad of Megenburg, about 1350, and first printed at Augsburg in 1475, with 12 woodcuts—being itself based on a still earlier MS. by Thomas Cantimpratensis, a Belgian.

In Konrad's book the second section deals with meteorology, under the general heading of "Concerning the heavens and the seven planets." The first nine chapters deal with astronomy, the subsequent ones are :—

- |                                                         |                              |
|---------------------------------------------------------|------------------------------|
| 10. Of the Air.                                         | 22. Of Honey.                |
| 11. „ Moving Stars (comets, milky way, shooting stars). | 23. „ Ladanum Wood.          |
| 15. „ the Winds.                                        | 24. „ Manna.                 |
| 16. „ the Rain.                                         | 25. „ Thunder and Lightning. |
| 17. „ the Dew.                                          | 26. „ Fog.                   |
| 18. „ the Snow.                                         | 27. „ Solar Halos.           |
| 19. „ Hoarfrosts.                                       | 28. „ Double Suns.           |
| 20. „ Hail.                                             | 29. „ Sun Streaks.           |
| 22. „ Mildew.                                           | 30. „ the Rainbow.           |

Perhaps the best idea of the work will be given by taking a single paragraph and giving it, first in the quaint old German and then in a free translation. Here is one from the chapter on Wind :—

“Ez geschiht oft, daz die widerwärtigen wind beegent ainander, als der sudner dem nordner oder der ostner dem westner. Welher denne sterker ist, der wirft den andern zuo der erden oder in ain wazzer also vesticleich ze stunden, daz er scheff under kert. Ist aber, daz si gleich starch sint, so ringent si mit ainander so vast, daz si paid zuo der erden vallent und varnt in ainer snellen werbeln weise und zuckent oft mit ainen grozen stain oder ainen menschen oder ain ander swaerez dinch und füerent daz mit in auf in die lüft. Wenne aber si also vallent in daz mer, so werfent si daz mer-wazzer auf und giezent ez an daz lant und verderbent lant und guot.”

“It often occurs that winds resist one against the other ; as for instance, the S. against the N. or the E. against the W. ; whichever is the stronger will drive the other to the earth or into the water, so as to blow the ships over. If they are equally strong, they struggle so much, that they fall to the earth together, and in a rapid whirl they will often suck up large stones or a man or any other heavy thing, and carry it up with them into the sky ; If, however, they fall in the sea, they suck up the sea water and carry it on to the land.”

We cannot refer at length to Dr. Hellmann's notes upon Elucidarius, and the little weather prognostic books, down to Raspail and Mathieu (De la Drôme), but as a specimen of the completeness of his work (even when he professes to give only a selection), he quotes as among the authors of modern English books of weather prophecies, Blake, Doxat, Leigh, Murphy, Simmonite and Whistlecraft. Few Englishmen could have given a fuller list.

The book is like most of Dr. Hellmann's, crammed with information, so that it is almost impossible to lay it down, and he constantly startles one with bits of information where least expected ; for instance, when speaking of Conrad's "Book of Nature" as the popular text book of the 15th century, he refers to the "Sphaera Mundi" of Sacro Bosco, and then in a foot note he goes off to tell us

that Joannes de Sacro Bosco was a learned Englishman, born at Holywood (= Sacro Bosco), in Yorkshire, who early in the 13th century was teaching at the University of Paris, where he wrote "Sphaera Mundi," which was subsequently much recommended by Melancthon. We did not know of any Holywood in Yorkshire, but on reference to Poggendorff's invaluable *Biog.-Lit. Handwörterbuch* we see that he is described as "Joannes de Sacro Bosco (Sacrobusto, Sacrobuschus = Holy wood, Holy bush) born at Holywood, now Halifax, in Yorkshire;" the date of birth is not given, but was probably between 1180 and 1200. Although we find that Sherburn in his scarce translation of Manilius also states Halifax to have been the birth-place, we are doubtful—authorities differ, and we can find no one else who describes Halifax as ever having been called Holywood. There are three suggested derivations of the name of Halifax: (1) Halig fax—Holy Hair (because at the shrine they had the hair of the Virgin Mary); (2) Holy face (because at the shrine they had the face of John the Baptist); (3) Holy ways (*Fax* in Norman-French) because of the shrine at the intersection of four roads. Domesday Book does not mention Halifax, but it was written about 100 years before Joannes de Sacro Bosco was born.

The book is as well printed as are all those issued by the Urania Society, and additional interest is given by the facsimile reproduction of the title-pages of some of the rarest pamphlets.

### RAIN MAKING.

THIS subject is one upon which it is extremely difficult to pronounce a decided opinion, and upon which even persons who witness the experiments cannot be certain as to their success.

We have always been ready to welcome any help as to weather prophecy, and we are ready to do the same for rain makers—when they have proved their case.

In this country it is not often that we need try to increase the fall of rain. But any real control over atmospheric phenomena seems so improbable that experiments in that direction have not merely to justify themselves by the result, but have also to remove strong prejudices from many minds.

We stated in our July number [p. 81] that General Dyrenfurth was trying the effect of firing powerful explosives both on the ground, and at considerable heights, in Kansas, one of the dry States in the centre of North America.

The difficulty in deciding upon his success, lies *not* in ascertaining whether rain follows within a reasonable period after the discharge of his explosives, but in knowing whether or not rain would have fallen had the explosives not been discharged. As regards his experiments we think that General Dyrenfurth designed them well, and tried them in a locality in which the difficulties to be overcome were greater than usual. Perhaps we had better amplify that remark so that everyone may understand it. Rain falls because the air whence it falls is *at its then temperature* unable to hold any more

vapour, the surplus vapour falls as rain. Raise the temperature of that air, it can then hold more vapour and rain will cease to fall. Cool the air, it can hold less vapour and the rain will become heavier.

General Dyrenfurth's theory was, we presume, that his violent explosions would cause unusual vertical motion in the air, and thus some of the warm air from the lower strata would be forced up into colder regions, and the vapour in it would be condensed and fall as rain. Evidently the drier the district the greater must be the disturbance in order to produce condensation. Kansas is a very dry State, and that is why we said that the difficulties were greater than usual.

We have at present no official information as to the experiments, but on August 27th the New York correspondent sent the following telegram to the *Standard*, in which paper it appeared on the 28th :—

NEW YORK, THURSDAY NIGHT.

Within the last three weeks nine showers of rain, of which one was considerable, have been artificially produced in a region almost rainless normally. The district selected for experiment by the United States Agricultural Department is near the midlandstaked plains of Texas, a grazing country, where agriculture is impossible because of the aridity of the climate. For more than three years no rain has fallen there, except in very occasional small showers.

On Wednesday the vegetation was parched, the sky unclouded, the barometer at 30.50, the hygrometer between dry and very dry. The cow boys, who are shrewd judges of the weather, declared that rain was impossible. With this condition of the atmosphere, the following experiment was tried :—

Five balloons, each twelve feet in diameter, and charged with one-third oxygen and two-thirds hydrogen, were exploded by electricity or time fuses, at heights ranging from one thousand feet to five miles. Three hundred and fifty pounds of Rackarock dynamite was also exploded in scattered packages, of from ten to twenty pounds, at intervals of one minute, ending at ten o'clock p.m. At three o'clock the next morning a sharp clap of thunder was followed by heavy rain. At sunrise a beautiful rainbow was seen. The rain stopped at eight o'clock, but began again to fall after more explosives had been used.

Evidently the writer regarded the experiments as having been successful ; we, however, wait for full details—for something better than a hygrometer which stood “ between dry and very dry.”

Of course anything of the above kind is sure to have imitators ; there are already two in the field.

1. A Mr. Melbourne, of whom we had not previously heard, though he is said to have broken up 12 droughts in Australia, and 5 in New Zealand, is reported to have established a laboratory at Canton, Ohio, and by the action of some wonderful machine in this laboratory to produce rain at will. If this is not entirely a fictitious story, it sounds like one.\*

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\* Evidently Mr. Melbourne is looking out for money. The following telegram appeared in *The Times* of October 13th, 1891 :—

A CONTRACT TO MAKE RAIN.—*Topeka (Kansas)*, Oct. 12th.—Melbourne, the rain-maker, signed a contract on Saturday with a local organization to water the north-western part of Kansas during June, July, and August, 1892, at a rate of \$1 per acre of the area watered. It is his intention to hold a series of mass meetings throughout the North-Western States for the purpose of awakening interest in his enterprise.—*Dalziel*.

2. This is more definite ; we have abridged it from an article in the *Chicago Journal of Commerce* for July 23rd, 1891. Mr. Louis Gathman, of Chicago, begins by accepting the theory of rain being produceable by the discharge of artillery, but says that such cannonading must be very costly, and that the object of explosions, that is to say, the creation of vertical currents, can be more cheaply obtained by exploding at a great altitude shells filled with liquified carbonic acid, the rapid expansion of the gas creating an extensive current of cold air. Mr. Gathman seems to have tried only one experiment at a considerable height, viz., in 1890, when he fired such a shell from Fort Sheridan ; but the result was not in accordance with the theory. The shell was thrown to an altitude "of about 600 ft. and then exploded, producing a cloud or visible vapour (in the clear sky), which drifted along with the current of air, and was visible for several miles." We think all the better of Mr. Gathman for this statement, a quack would never have admitted that it "drifted along" instead of pouring down, as by theory it ought to have done. He then says that even with small quantities of the compressed gas, and the small elevation of his astronomical observatory (75 ft.) he has produced showers on a small scale. We think that a very large manufactory will be needed to produce cooling mixture enough for even one State of the Union.

Lastly, we re-print from an American paper a rather amusing article, the conclusion of which is diametrically opposed to the report in the *Standard*, and which therefore supports our decision to wait for something more authoritative than the hygrometer which "stood between dry and very dry."

#### EXPERIMENTS IN RAIN-MAKING.

"When the official rainmaker of a black tribe in equatorial Africa is paid, a proper number of goats and fowls to bring down a little moisture for the benefit of the crops of his less-gifted tribesmen, he collects with due solemnity his magic herbs and other charms, greases himself with palm oil, grasps his sacred rattle and begins to tamper with the weather. Unfortunately the matter of artificial rainfall in Africa has not been studied by Caucasian scientists with that care which the learning of their gifted black brothers who practice the art at reasonable rates would seem to merit. In consequence of this the precise method of bringing on a precipitation of moisture varying from a light dew to a tremendous downpour is not known beyond the borders of those great forests where dwell the pigmies, the anthropophagi, and other wild people done in black.

"The United States Government, however, has decided to go into the rain-making business on its own account. Singularly enough, no soulless corporation of grasping capitalists has yet provided the arid regions of the West with summer showers, spring rains and miscellaneous drizzles to suit the taste. Senator Farwell of Chicago, desiring to supply this want, secured from the last Congress, which had a billion to spend and spent it royally, a modest appropriation to be used in producing experimental showers. Not since Prof. Morse obtained money from Congress with which to build a telegraph line from Washington to Baltimore has the Nation indulged in such a fantastic enterprise. The scoffers of that day knew very well that it was wretched nonsense to think that people could talk with each other over a wire by means of a clicking instrument, and they said so very plainly. Though these scoffers were wrong

and Prof. Morse was right, this does not prove that the rain-making experiments which the Government now has under way are bound to be a success.

"Some persons may be surprised to learn that the approved Darkest-Africa method of producing thunder-storms is not to be employed by the rainmakers of the United States. They are not content to shake a rattle made of a calabash with pebbles in it, to dance wildly in a circle and to howl forth tremendous incantations. Such proceedings as these may yield copious showers in the Congo Free State and in the vicinity of Ujiji, but they are not suited to the climate of the American rainless zone. A new method, which doubtless would appear sufficiently ludicrous to the experienced meteorologists of Ngoombe and Bolobo, has been approved by the chiefs of the Signal Service Bureau and the Smithsonian Institution. By this method a formidable quantity of a high explosive is sent up in a balloon and then touched off with an electric spark when it has reached the proper altitude.

"The other day Gen. Robert G. Dyrenforth, who now holds the responsible position of head rainmaker for the Government, went out to Piney Creek, not far from Washington, with three balloons and a supply of oxyhydrogen. Along with him went Assistant Secretaries Nettleton and Spaulding of the Treasury Department, Comptroller Lacey, Assistant Secretary Willetts of the Agricultural Department, Director Howell of the Geological Survey and Patent Commissioner Mitchell. These gentlemen were fully equipped for the work of producing a rain-storm. With singular recklessness, which cannot be too severely condemned in persons holding high official positions, they uttered no warning to the people of Piney Creek so that those people might get out their umbrellas. They merely started in coldly and imperturbably to make it rain.

"Gen. Dyrenforth sent up one of his muslin balloons inflated with 525 cubic feet of oxyhydrogen, and this was exploded at a height of 800 feet. No rain-cloud gathered; no heavy drops pattered down indicating that a shower was impending. The General grieved, but not disheartened, sent up his two remaining balloons, touched them off at a height of 1,000 feet, and then spread his umbrella and waited. The detonations shook down no drop of moisture. The ammunition was all gone and the denizens of Piney Creek had escaped a wetting. The distinguished gentlemen were somewhat disappointed, though their experiments had passed off admirably, with the slight exception that they had failed to make it rain. However, they were consoled by the knowledge that the professional rainmakers of the African forest do not always bring on a shower when they dance sagely in magical wise and utter their most persuasive yells.

Two thousand dollars has been spent thus far without producing so much, as a heavy dew. There is \$7,000 yet to be used for the same purpose and Gen. Dyrenforth thinks he may succeed with its aid in creating a cloud-burst on a cactus plain where rain has not fallen for a thousand years."

## THE CLIMATE OF THE BRITISH EMPIRE DURING 1890.

The number of stations available for our annual summary of the climates of the Empire is above the average, and with the exception of Esquimalt, British Columbia, which in the middle of the year replaced Victoria, British Columbia, where the observations had been discontinued, all appear that are printed in the monthly tables.

The table for 1890 exhibits some exceptional features: for the first time in the 17 years during which the tables have been published the highest temperature occurred at an East Indian station, instead of in Australia, and the following table shows clearly how phenomenal this is, for the 1890 max. at Calcutta is with one exception the highest in 9 years, while the Adelaide max. is 2°·4 lower

than that of any other year in the same period. The highest max. in sun was, however, recorded at Adelaide, though it is not exceptional for this to occur at Calcutta.

We add, for comparison, the highest shade temperatures at three of the stations at which the max. of the year usually exceeds 100°.

| <i>Absolute Maximum Temperature.</i> |       |           |       |            |       |           |
|--------------------------------------|-------|-----------|-------|------------|-------|-----------|
|                                      |       | CALCUTTA. |       | MELBOURNE. |       | ADELAIDE. |
| 1882                                 | ..... | 101·5     | ..... | 110·5      | ..... | 112·0     |
| 1883                                 | ..... | 100·2     | ..... | 104·9      | ..... | 109·5     |
| 1884                                 | ..... | 103·7     | ..... | 100·7      | ..... | 110·2     |
| 1885                                 | ..... | 105·3     | ..... | 101·6      | ..... | 107·4     |
| 1886                                 | ..... | 103·5     | ..... | 104·1      | ..... | 112·4     |
| 1887                                 | ..... | 102·0     | ..... | 104·9      | ..... | 111·2     |
| 1888                                 | ..... | 106·6     | ..... | 104·0      | ..... | 107·5     |
| 1889                                 | ..... | 101·8     | ..... | 99·8       | ..... | 109·0     |
| Mean                                 | ..... | 103·1     | ..... | 103·8      | ..... | 109·9     |
| 1890                                 | ..... | 105·6     | ..... | 103·4      | ..... | 105·0     |

The mean temp. of the East Indian stations, on the other hand, far exceeds that of Australia, and Ceylon, year after year, heads the list with a mean above 80°; nearly 20° higher than that of Adelaide.

Winnipeg, of course, monopolises all the other extremes of temperature, for the cold even at the other Canadian stations bears no comparison with the extreme rigour of its winters.

It is also unusual for the least range in the year and the least mean daily range to occur at different stations, although this has occurred more than once before. Small range of temp., great humidity, and a large amount of cloud, of course, all occur at insular stations, and London, Ceylon, Barbados, and Mauritius, have at one time or another recorded the extremes of most of these elements.

#### SUMMARY.

|                                       |                                      |
|---------------------------------------|--------------------------------------|
| <i>Highest Temp. in shade</i> .....   | 105°·6 at Calcutta on April 24th     |
| <i>Lowest</i> " " .....               | — 39°·4 at Winnipeg on January 17th  |
| <i>Greatest Range in year</i> .....   | 135°·9 at Winnipeg                   |
| <i>Least</i> " " .....                | 25°·4 at Ceylon, Colombo             |
| <i>Greatest Mean Daily Range</i> ...  | 22°·9 at Winnipeg                    |
| <i>Least</i> " " " .....              | 10°·1 at Mauritius                   |
| <i>Highest Mean Temp.</i> .....       | 80°·5 at Ceylon, Colombo             |
| <i>Lowest</i> " " .....               | 32°·8 at Winnipeg                    |
| <i>Driest Station</i> .....           | Adelaide, mean humidity 62           |
| <i>Dampest Station</i> .....          | London, mean humidity 80             |
| <i>Highest Temperature in Sun</i> ... | 163°·9 at Adelaide                   |
| <i>Lowest Temperature on Grass</i>    | — 7°·1 Toronto*                      |
| <i>Greatest Rainfall</i> .....        | 82·90 in. at Trinidad                |
| <i>Least</i> " .....                  | 19·96 in. at Jamaica                 |
| <i>Most Cloudy Station</i> .....      | Tasmania, Hobart, average amount 6·5 |
| <i>Least Cloudy Station</i> .....     | Malta, average amount 3·4            |

\* There being no grass min. thermometer at the other Canadian stations.



## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1891.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain. |       | Aver. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|-------------|-------|-------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.      | Days. |       |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |             |       |       |
|                                                                  | °         |       | °        |       | °        | °    | °             | 0-100     | °               | °                 | inches      |       |       |
| England, London .....                                            | 57·7      | 2     | 23·7     | 12    | 47·8     | 34·6 | 34·7          | 80        | 101·1           | 18·0              | 2·01        | 15    | 6·5   |
| Malta.....                                                       | 71·1      | 11    | 39·8     | 4     | 62·4     | 49·0 | 46·6          | 77        | 135·3           | 33·0              | ·17         | 4     | 4·6   |
| <i>Cape of Good Hope</i> ...                                     | 91·7      | 20    | 46·8     | 7     | 79·5     | 57·9 | ...           | ...       | ...             | ...               | ·38         | 5     | ...   |
| <i>Mauritius</i> .....                                           | 83·6      | 3, 9  | 65·2     | 25    | 81·4     | 71·8 | 69·1          | 80        | 134·8           | 57·3              | 11·74       | 18    | 6·7   |
| Calcutta.....                                                    | 91·5      | 22    | 62·9     | 12    | 84·9     | 67·8 | 67·4          | 76        | 154·8           | 57·8              | 3·94        | 9     | 4·7   |
| Bombay.....                                                      | 87·0      | 4, 18 | 69·0     | 14b   | 84·6     | 72·0 | 66·5          | 67        | 137·1           | 56·6              | ·20         | 1     | 1·2   |
| Ceylon, Colombo .....                                            | 91·0      | 23    | 69·8     | 2     | 87·8     | 73·9 | 71·8          | 77        | 147·0           | 65·0              | 9·43        | 15    | 4·2   |
| <i>Melbourne</i> .....                                           | 99·5      | 7     | 45·8     | 1     | 75·7     | 55·7 | 53·2          | 66        | 148·2           | 33·4              | 1·26        | 6     | 5·1   |
| <i>Adelaide</i> .....                                            | 102·6     | 7     | 50·0     | 23    | 81·9     | 57·9 | 49·6          | 48        | 157·4           | 39·7              | ·57         | 4     | 1·8   |
| <i>Tasmania, Hobart</i> .....                                    | 97·5      | 7     | 45·0     | 2, 24 | 73·3     | 52·5 | 51·0          | 62        | 142·0           | 37·8              | ·96         | 7     | 5·5   |
| <i>Wellington</i> .....                                          | 81·0      | 11    | 43·0     | 22    | 67·7     | 52·5 | 55·2          | 84        | 130·0           | 35·0              | 1·45        | 10    | 4·1   |
| <i>Auckland</i> .....                                            | 77·0      | 8     | 46·0     | 22    | 71·2     | 57·7 | 56·7          | 81        | 138·0           | 42·0              | 1·57        | 22    | 5·2   |
| Jamaica, Kingston.....                                           | 91·4      | 15    | 63·2     | 3     | 85·8     | 67·4 | 65·4          | 70        | ...             | ...               | ·04         | ...   | ...   |
| Trinidad .....                                                   | 94·0      | 26    | 64·0     | 11c   | 87·9     | 68·6 | 66·4          | 69        | 156·0           | 52·0              | ·03         | 3     | ...   |
| Toronto .....                                                    | 52·1      | 29    | 4·7      | 6     | 35·0     | 22·5 | 23·5          | 77        | ...             | —3·2              | 3·03        | 20    | 6·7   |
| New Brunswick,<br>Fredericton .....                              | 48·8      | 14a   | 11·6     | 15    | 36·2     | 16·4 | 21·2          | 70        | ...             | ...               | 3·66        | 16    | 4·8   |
| Manitoba, Winnipeg ...                                           | 50·5      | 28    | —28·1    | 4     | 22·0     | —3·9 | ...           | 92        | ...             | ...               | ·15         | 6     | 4·1   |
| British Columbia,<br>Esquimalt .....                             | 57·6      | 14    | 20·0     | 3     | 47·5     | 35·0 | 36·9          | 83        | ...             | ...               | 3·42        | 21    | 6·2   |

a And 29.    b And 15.    c And 23.

## REMARKS.

MALTA.—Mean temp. 54°·4 ; mean hourly velocity of wind 9·0 miles. Sea temp. rose from 57°·9 to 61°·1. A little H fell on the 3rd. J. SCOLES.

*Mauritius*.—Mean temp. of air 1°·4 below, dew point 0°·7 below, and R 3·53 in. above, their respective averages. Mean hourly velocity of wind 9·3 miles, or 0·7 below the average ; extremes, 30·9 on 19th and 0·0 on 5th, 6th and 29th ; prevailing direction S.E. by E. L on 2nd and 4th, and T on 5th, 6th, and 29th.

C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 9 days, and L was seen on 7 other days.

J. C. H. CLARKE, Lieut.-Col., R.E.

*Melbourne*.—Mean temp. of air 2°·0 above, of dew point 1°·2 above, humidity 2 below, cloud 0·5 below, and R ·80 in. below, their respective averages. Prevailing direction of wind S. ; strong on 5 days. Heavy dew on 5 days. T and L on the 9th, L on the 10th and 16th. T on 25th and 30th.

R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean temp. 0°·5, and R ·50 in. below, their averages of 34 years. Amount of cloud lower than in any previous March ; 17 clear days. C. TODD, F.R.S.

*Hobart*.—Mean temp. 4°·3, and humidity 12 above, the average of 7 years.

J. SHORTT, Capt. R.N.

*Wellington*.—Generally fine up to the 14th, with strong N.W. wind in the early part ; from the 14th to the end showery, with intervals of fine weather. Prevailing wind N.W., strong on 5 days. L on 1st. Fog on 16th and 17th. Mean temp. 2°·0 below, and R less than half, the average.

R. B. GORE.

*Auckland*.—A rather dry month, with no heavy falls of R, or strong winds. Mean temp. and R both considerably below the average.

T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,  
 SEPTEMBER, 1891.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
 see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                 | Total<br>Rain. | Div.   | STATION.                 | Total<br>Rain. |
|-------|--------------------------|----------------|--------|--------------------------|----------------|
|       |                          | in             |        |                          | in.            |
| II.   | Dorking, Abinger Hall.   | 1.49           | XI.    | Builth, Llanwrtyd Wells  | 4.33           |
| "     | Margate, Birchington...  | ...            | "      | Rhayader, Nantgwillt..   | 4.18           |
| "     | Brighton Prestonville Rd | 1.14           | "      | Corwen, Rhug .....       | 4.07           |
| "     | Hailsham .....           | .93            | "      | Carnarvon, Cocksidia ... | 6.50           |
| "     | Ryde, Thornbrough .....  | 1.21           | "      | I. of Man, Douglas ..... | 6.91           |
| "     | Alton, Ashdell .....     | 1.63           | XII.   | Stoneykirk, Ardwell Ho.  | 2.70           |
| III.  | Oxford, Magdalen Col...  | 1.34           | "      | New Galloway, Glenlee    | 6.76           |
| "     | Banbury, Bloxham .....   | 1.19           | "      | Melrose, Abbey Gate ...  | 4.55           |
| "     | Northampton .....        | .50            | XIII.  | N. Esk Res. [Penicuik]   | 10.35          |
| "     | Cambridge, Fulbourne..   | 1.44           | XIV.   | Ballantrae, Glendrishaig | 4.79           |
| "     | Wisbech, Bank House..    | .72            | "      | Glasgow, Queen's Park.   | 4.78           |
| IV.   | Southend .....           | .48            | XV.    | Islay, Gruinart School.. | 4.05           |
| "     | Harlow, Sheering .....   | .96            | XVI.   | Dollar .....             | 6.41           |
| "     | Rendlesham Hall .....    | .61            | "      | Balquhiddier, Stronvar.. | 9.07           |
| "     | Diss .....               | 1.25           | "      | Coupar Angus Station..   | 1.76           |
| "     | Swaffham .....           | 1.02           | "      | Dunkeld, Inver Braan..   | 2.81           |
| V.    | Salisbury, Alderbury ... | 1.12           | "      | Dalnaspidal H.R.S. ...   | 7.85           |
| "     | Warminster .....         | ...            | XVII.  | Keith H.R.S. ....        | 2.10           |
| "     | Bishop's Cannings .....  | 2.06           | "      | Forres H.R.S. ....       | 1.27           |
| "     | Ashburton, Holne Vic.... | 2.86           | XVIII. | Fearn, Lower Pitkerrie.  | 1.39           |
| "     | Okehampton, Oaklands.    | 3.65           | "      | Loch Shiel, Glenaladale  | 14.85          |
| "     | Lynmouth, Glenthorne.    | 3.29           | "      | N. Uist. Loch Maddy ...  | 7.15           |
| "     | Probus, Lamellyn .....   | 3.47           | "      | Invergarry .....         | 8.76           |
| "     | Launceston, S. Petherwin | ...            | "      | Aviemore H.R.S. ....     | 2.78           |
| "     | Wincanton, Stowell Rec.  | 2.54           | "      | Loch Ness, Drumnadrochit | 3.56           |
| "     | Wells, Westbury .....    | ...            | XIX.   | Lairg H.R.S. ....        | ...            |
| VI.   | Bristol, Clifton .....   | 2.33           | "      | Scourie .....            | 4.73           |
| "     | Ross, The Graig .....    | 1.37           | "      | Watten H.R.S. ....       | 1.62           |
| "     | Wem, Clive Vicarage ...  | 2.66           | XX.    | Dunmanway, Coolkelure    | 6.47           |
| "     | Cheadle, The Heath Ho.   | 1.98           | "      | Fermoy, Gas Works ...    | 3.42           |
| "     | Worcester, Diglis Lock   | .91            | "      | Darrynane Abbey .....    | 4.78           |
| "     | Coventry, Coundon .....  | 1.43           | "      | Tipperary, Henry Street  | 3.10           |
| VII.  | Ketton Hall [Stamford]   | 1.25           | "      | Limerick, Kilcornan ...  | 2.67           |
| "     | Grantham, Stainby .....  | 1.13           | "      | Ennis .....              | 2.98           |
| "     | Horncastle, Bucknall ... | 1.35           | "      | Miltown Malbay .....     | 3.76           |
| "     | Worksop, Hodsck Priory   | 1.07           | XXI.   | Gorey, Courtown House    | 3.10           |
| VIII. | Neston, Hinderton .....  | 3.75           | "      | Mullingar, Belvedere ... | 2.68           |
| "     | Knutsford, Heathside...  | 3.20           | "      | Athlone, Twyford .....   | 3.26           |
| "     | Lancaster .....          | ...            | "      | Longford, Currygrane...  | 2.70           |
| "     | Broughton-in-Furness..   | 7.19           | XXII.  | Galway, Queen's Coll...  | 3.84           |
| IX.   | Ripon, Mickley .....     | 2.37           | "      | Crossmolina, Enniscoe..  | 5.46           |
| "     | Scarborough, West Bank   | 1.59           | "      | Collooney, Markree Obs.  | 2.62           |
| "     | East Layton [Darlington] | 1.88           | "      | Ballinamore, Lawderdale  | 3.18           |
| "     | Middleton, Mickleton..   | 3.09           | "      | Lough Sheelin, Arley ..  | 2.47           |
| X.    | Haltwhistle, Unthank..   | 4.69           | XXIII. | Warrenpoint .....        | 2.18           |
| "     | Bamburgh .....           | 2.20           | "      | Seaforde .....           | 2.16           |
| "     | Shap, Copy Hill .....    | ...            | "      | Belfast, New Barnsley..  | 3.16           |
| XI.   | Llanfrehfa Grange .....  | 1.96           | "      | Bushmills, Dundarave...  | 2.56           |
| "     | Llandovery .....         | 4.62           | "      | Stewartstown .....       | 2.53           |
| "     | Castle Malgwyn .....     | 3.71           | "      | Buncrana .....           | 2.95           |

## SEPTEMBER, 1891.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.      |                                               |                                  |                 |      | Days on which<br>·01 or more fell. | TEMPERATURE.    |      |                   |           | No. of<br>Nights<br>below<br>32° |      |      |
|--------|-----------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------|----------------------------------|-----------------|------|------------------------------------|-----------------|------|-------------------|-----------|----------------------------------|------|------|
|        |                                                                                                           | Total<br>Fall. | Differ-<br>ence<br>from<br>average<br>1880-9. | Greatest<br>Fall in<br>24 hours. |                 | Max. |                                    | Min.            |      | In shade.         | On grass. |                                  |      |      |
|        |                                                                                                           |                |                                               | Dpth                             | Date            |      |                                    | Deg.            | Date |                   |           |                                  | Deg. | Date |
|        |                                                                                                           |                |                                               |                                  |                 |      |                                    |                 |      |                   |           |                                  |      |      |
|        |                                                                                                           | inches.        | inches.                                       | in.                              |                 |      | Deg.                               | Date            | Deg. | Date              |           |                                  |      |      |
| I.     | London (Camden Square) ...                                                                                | 1·03           | — 1·48                                        | ·17                              | 14              | 15   | 80·4                               | 13              | 43·3 | 24                | 0         | 0                                |      |      |
| II.    | Maidstone (Hunton Court)...                                                                               | ·94            | — 1·65                                        | ·25                              | 21              | 13   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| III.   | Strathfield Turgiss .....                                                                                 | 1·79           | — ·66                                         | ·32                              | 19              | 20   | 80·4                               | 12              | 41·5 | 20                | 0         | 0                                |      |      |
| III.   | Hitchin .....                                                                                             | ·87            | — 1·63                                        | ·23                              | 30              | 14   | 81·0                               | 11              | 42·0 | 24                | 0         | 0                                |      |      |
| IV.    | Winslow (Addington) .....                                                                                 | ·88            | — 1·79                                        | ·14                              | 18 <sup>a</sup> | 14   | 81·0                               | 11              | 40·0 | 15 <sup>f</sup>   | 0         | 0                                |      |      |
| IV.    | Bury St. Edmunds (Westley)                                                                                | 1·16           | — 1·54                                        | ·27                              | 14              | 11   | 71·0                               | 11              | 45·0 | 22                | 0         | ...                              |      |      |
| V.     | Norwich (Cossey) .....                                                                                    | 1·06           | — 1·60                                        | ·45                              | 14              | 9    | 81·0                               | 12              | ...  | ...               | ...       | ...                              |      |      |
| V.     | Weymouth (Langton Herring)                                                                                | 2·31           | — ·11                                         | ·97                              | 13              | 15   | 70·0                               | 11 <sup>c</sup> | 46·0 | 23                | 0         | 0                                |      |      |
| "      | Barnstaple .....                                                                                          | 3·18           | — ·31                                         | ·60                              | 17              | 15   | 80·0                               | 13              | 41·0 | 3, 4              | 0         | ...                              |      |      |
| "      | Bodmin (Fore Street) .....                                                                                | 4·13           | — ·34                                         | ·63                              | 18              | 21   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| VI.    | Stroud (Upfield) .....                                                                                    | 1·79           | — 1·12                                        | ·28                              | 6               | 19   | 78·0                               | 11 <sup>d</sup> | 44·0 | 3, 6 <sup>y</sup> | 0         | 0                                |      |      |
| "      | Church Stretton (Woolstaston)                                                                             | 3·60           | + 1·10                                        | 1·03                             | 19              | 18   | 77·0                               | 11              | 43·0 | 22                | 0         | 0                                |      |      |
| "      | Tenbury (Orleton) .....                                                                                   | 1·32           | — 1·29                                        | ·40                              | 19              | 11   | 81·0                               | 10              | 37·0 | 7                 | 0         | 0                                |      |      |
| VII.   | Leicester (Barkby) .....                                                                                  | 1·18           | — 1·46                                        | ·42                              | 21              | 12   | 82·0                               | 10              | 36·0 | 2                 | 0         | 0                                |      |      |
| "      | Boston .....                                                                                              | ·59            | — 2·18                                        | ·25                              | 21              | 11   | 80·0                               | 10              | 42·0 | 3, 15             | 0         | 0                                |      |      |
| "      | Hesley Hall [Tickhill] .....                                                                              | ·94            | — 1·22                                        | ·24                              | 21              | 10   | 84·0                               | 11              | 38·0 | 24                | 0         | ...                              |      |      |
| VIII.  | Manchester (Plymouth Grove)                                                                               | 3·00           | — ·47                                         | ·53                              | 19              | 18   | 82·0                               | 11 <sup>e</sup> | 42·0 | 2                 | 0         | ...                              |      |      |
| IX.    | Wetherby (Ribston Hall) ...                                                                               | 1·60           | — ·86                                         | ·51                              | 20              | 7    | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Skipton (Arnccliffe) .....                                                                                | 4·62           | — ·14                                         | ·68                              | 5               | 22   | 81·0                               | 11              | 43·0 | 20                | 0         | ...                              |      |      |
| "      | Hull (Pearson Park) .....                                                                                 | 1·19           | — 1·25                                        | ·34                              | 21              | 16   | 82·0                               | 10              | 43·0 | 24                | 0         | ...                              |      |      |
| X.     | Newcastle (Town Moor) .....                                                                               | 2·62           | — ·16                                         | ·48                              | 20              | 14   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Borrowdale (Seathwaite) .....                                                                             | 20·86          | + 9·13                                        | 4·58                             | 5               | 21   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| XI.    | Cardiff (Ely) .....                                                                                       | 2·76           | — ·98                                         | ·45                              | 3               | 18   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Haverfordwest .....                                                                                       | 4·49           | + ·09                                         | ·62                              | 20              | 20   | 71·9                               | 13              | 37·1 | 7                 | 0         | ...                              |      |      |
| "      | Carno (Tybrith) .....                                                                                     | 3·83           | + ·06                                         | ·77                              | 19              | 18   | 67·0                               | 10              | 38·0 | 23                | 0         | ...                              |      |      |
| "      | Llandudno .....                                                                                           | 3·94           | + 1·72                                        | ·97                              | 30              | 14   | 81·1                               | 10              | 47·4 | 3                 | 0         | 0                                |      |      |
| XII.   | Cargen [Dumfries] .....                                                                                   | 4·81           | + 1·25                                        | ·98                              | 5               | 16   | 79·0                               | 13              | 35·4 | 23                | 0         | ...                              |      |      |
| "      | Jedburgh (Sunnyside) .....                                                                                | 4·29           | + 1·60                                        | 1·12                             | 20              | 19   | 75·0                               | 12 <sup>e</sup> | 37·0 | 23                | 0         | ...                              |      |      |
| XIV.   | Old Cumnock .....                                                                                         | 5·65           | + 1·82                                        | ·89                              | 20              | 24   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| XV.    | Lochgilhead (Kilmory) .....                                                                               | 7·51           | + 2·38                                        | ·70                              | 1, 25           | 23   | ...                                | ...             | 38·0 | 22                | 0         | ...                              |      |      |
| "      | Oban (Craigvarren) .....                                                                                  | 7·50           | ...                                           | ·80                              | 10              | 24   | 75·4                               | 13              | 40·5 | 23                | 0         | ...                              |      |      |
| "      | Mull (Quinish) .....                                                                                      | 7·11           | + 2·08                                        | ·80                              | 25              | 23   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| XVI.   | Loch Leven Sluices .....                                                                                  | 6·30           | + 3·51                                        | 2·10                             | 21              | 13   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Dundee (Eastern Necropolis)                                                                               | 4·25           | + 1·74                                        | 2·05                             | 20              | 13   | 79·1                               | 12              | 41·3 | 8                 | 0         | 0                                |      |      |
| XVII.  | Braemar .....                                                                                             | 4·17           | + 1·31                                        | 1·28                             | 20              | 17   | 75·0                               | 12              | 30·5 | 23                | ...       | 3                                |      |      |
| "      | Aberdeen (Cranford) .....                                                                                 | 5·46           | ...                                           | 2·70                             | 20              | 16   | 80·0                               | 12              | 32·0 | 31                | 1         | ...                              |      |      |
| XVIII. | Strome Ferry .....                                                                                        | 8·29           | + 3·42                                        | 1·00                             | 25              | 22   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Inverness (Culloden) .....                                                                                | 2·00           | — ·45                                         | ...                              | ...             | ...  | 75·0                               | 12              | 35·0 | 23                | 0         | 2                                |      |      |
| XIX.   | Dunrobin .....                                                                                            | 1·92           | — ·67                                         | ·46                              | 2               | 15   | 72·5                               | 12              | 43·0 | 8                 | 0         | ...                              |      |      |
| "      | S. Ronaldsay (Roeberry) .....                                                                             | 2·77           | + ·11                                         | ·30                              | 5               | 21   | 64·0                               | 10              | 45·0 | 21                | 0         | ...                              |      |      |
| XX.    | Dromore Castle .....                                                                                      | 2·39           | — 1·64                                        | ·40                              | 2 <sup>b</sup>  | 11   | 76·0                               | 16              | 42·0 | 15                | 0         | ...                              |      |      |
| "      | Waterford (Brook Lodge) ...                                                                               | 3·01           | + ·09                                         | ·59                              | 7               | 14   | 73·0                               | 11              | 38·0 | 7                 | 0         | ...                              |      |      |
| "      | O'Briensbridge (Ross) .....                                                                               | 2·90           | ...                                           | ·63                              | 5               | 19   | 74·0                               | 13              | 42·0 | g                 | 0         | 0                                |      |      |
| XXI.   | Carlow (Browne's Hill) .....                                                                              | 2·23           | — ·59                                         | ·35                              | 25              | 18   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Dublin (Fitz William Square)                                                                              | 2·13           | + ·16                                         | ·56                              | 19              | 18   | 75·8                               | 10              | 44·8 | 7                 | 0         | 0                                |      |      |
| XXII.  | Ballinasloe .....                                                                                         | 2·97           | + ·18                                         | ·88                              | 5               | 22   | 71·0                               | 11              | 37·0 | 22                | 0         | ...                              |      |      |
| "      | Clifden (Kylemore) .....                                                                                  | 8·31           | ...                                           | ·86                              | 5               | 23   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| XXIII. | Waringstown .....                                                                                         | 2·18           | — ·98                                         | ·52                              | 5               | 21   | 80·0                               | 11              | 39·0 | 3                 | 0         | ...                              |      |      |
| "      | Londonderry (Creggan Res.) ..                                                                             | 3·64           | — ·14                                         | ·48                              | 5, 13           | 24   | ...                                | ...             | ...  | ...               | ...       | ...                              |      |      |
| "      | Omagh (Edenfel) .....                                                                                     | 4·04           | + ·66                                         | ·92                              | 5               | 21   | 72·0                               | 11              | 41·0 | 6                 | 0         | 0                                |      |      |

<sup>a</sup> And 22. <sup>b</sup> And 7, 10. <sup>c</sup> And 12. <sup>d</sup> And 12, 13. <sup>e</sup> And 13. <sup>f</sup> And 16. <sup>g</sup> Various.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON SEPTEMBER, 1891.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail. S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—September was remarkable for the number of days on which R fell, although the total for the month was below the average. This greatly discomforted the farmers, and did no small injury to the corn, some of which was uncut at the close. From the 8th to the 14th the weather was warm and genial. T on the 22nd.

ADDINGTON.—The least rainfall in any September for the last 20 years. From the 7th to the 14th very fine. On the 22nd a sharp TS, with heavy R; at Winslow H fell freely, but none here.

BURY ST. EDMUNDS, WESTLEY.—A lovely month; fine till the 14th, and very hot for the time of year. T on the 14th.

LANGTON HERRING.—The weather was fine for the first twelve days of the month, and the harvest was secured in a somewhat better condition than was anticipated. Heavy dews on 7th, 8th, 9th and 23rd; foggy on 18th, 19th and 20th; T on 22nd; solar halo on 26th. Mean temp. above the average.

BODMIN.—A cold wet month with high winds on several days. Very bad for the harvest, which was not finished at the close.

WOOLSTASTON.—The month commenced with a heavy gale, and the first week was cold and wet. The 8th was sunny and bright, and was followed by a few days of very hot summer weather, which was the saving of the harvest, and enabled much of it to be gathered in in fair condition. The latter part of the month was again cold and showery. Mean temp.  $57^{\circ}4$ .

ORLETON.—A fine warm month, but nearly  $1^{\circ}$  colder than September, 1890, although  $2^{\circ}$  above the average. From the 8th to 13th inclusive, very hot; the temp. on 3 days reaching  $80^{\circ}$ . No frost.

LEICESTER, BARKBY.—A fine warm month; harvest got in well. Some lovely clear nights, as well as days. T on the 26th.

MANCHESTER, PLYMOUTH GROVE.—Mean temp.  $57^{\circ}1$ . Summer weather prevailed on the 2nd and 3rd, also from 8th to 13th. The remainder of the month was very unsettled.

HULL, PEARSON PARK.—Thunderstorms on 4th and 14th.

## WALES.

HAVERFORDWEST.—Although so much R fell and there were so many rainy days, still the fall often taking place during the night, there were many more fine days than the figures show. The month generally was warm, day and night; no frosts occurred. The finest and warmest weather prevailed from the 9th to the 17th, during which the temp. was  $70^{\circ}$  and upwards, the sky cloudless, and the hygrometric condition of the air damp, with heavy night dews, which lay in shaded places all day. Strong winds from the West and South-West prevailed, reaching the force of a gale on one or two occasions.

## SCOTLAND.

CARGEN.—The weather during the month was extremely unsettled, and the harvest operations were greatly interfered with. In the higher part of the district a good deal of grain was still out in shocks at the close, and very much deteriorated. Strong gales were experienced on the 21st and 28th. T on the 4th.

JEDBURGH.—The weather was very unsettled, with much R and high winds and occasional low temp. The harvest was much retarded, and there is still much corn in the field, on some of the higher districts. Gale with R all day on the 1st; high winds on the 20th and 21st, with 2.12 in. of R in the two days.

OLD CUMNOCK.—On the 6th .23 in. of R and H fell in 10 minutes.

OBAN.—R very constant throughout the month, with a normal temp., which,

however, rose considerably about the middle. *August record*—total R 6·29 in. on 24 days; max. fall 1·15 in. on 31. Max. temp. 67°·0 on 7th and 22nd; min. 42°·9 on 30th.

MULL, QUINISH.—A wet and stormy month, but most of the grain in this district was secured in good order during the third week, thanks to four days of sunshine and strong N. wind

ABERDEEN, CRANFORD.—In 36 hours, on 20th and 21st, 3·85 in. of R fell.

CULLODEN.—Little R fell in the first half of the month, but on the 20th and 21st there was a good deal of flooding. Notwithstanding the state of the weather, the harvest generally was favourable.

#### IRELAND.

WATERFORD, BROOK LODGE.—Mean temp. 56°·3. Thick fog in early morning on the 7th, and fog on 8th. Summer weather on 10th, 11th and 12th.

O'BRIENSBRIDGE, ROSS.—A few splendid days from the 9th to the 14th, and some others at intervals of broken weather, made up a fairly good harvest season. Heavy gale from S.E. on the 25th.

DUBLIN.—September was a fine month in comparison with August, but both at the opening and close the weather was particularly unsettled, showery and squally. A period of beautiful summer-like weather occurred in the week ending the 12th, and as a whole the month was marked by a high temp., and an overwhelming prevalence of south-westerly winds. Mean temp. 57°·6, 1°·8 above the average. High winds on 14 days, attaining the force of a gale on four occasions—1st, 21st, 26th and 30th. Solar halo on 19th; lunar halos on 16th and 18th; T and L on 13th; auroræ observed on the 2nd, 9th and 11th; fog on the 10th.

WARINGSTOWN.—Four days of very unusual heat occurred, the max. temp. being on the 10th, 78°; 11th, 80°; 12th, 79°, and 13th, 77°.

EDENFEL.—The first week was a continuance of the rainy weather that prevailed throughout August, but on the 9th summer, with all its characteristics suddenly returned, and although the weather again became fresh and somewhat unsettled on the 13th, it did not wholly break till the end of the month, and as a result a good average harvest was for the most part gathered in fair order.

### EXCESSIVE RAIN IN THE ENGLISH LAKES.

*To the Editor of the Meteorological Magazine.*

SIR,—The rainfall here in the past two months has been so remarkable that you may think it worth notice. I have a rain gauge which has now been kept for 26 years, and I give you the results of observations:—

|                              | Average, 26 years. | Maximum.      | Rainfall in 1891. | Excess over average. |
|------------------------------|--------------------|---------------|-------------------|----------------------|
| August .....                 | 4·55 in. ...       | 8·55 in. ...  | 11·93 in. ...     | 162 per cent.        |
| September ...                | 5·33 in. ...       | 11·49 in. ... | 8·61 in. ...      | 61 per cent.         |
| Aug. & Sept. }<br>together { | 9·88 in. ...       | 17·16 in. ... | 20·54 in. ...     | 108 per cent.        |

At the same time it should be noticed that the total rainfall for nine months of this year is 38·37 in., or only 4 per cent. more than the average for that period, which is 36·86 in.

The year 1891 is therefore a marked instance of the uncertain and bad weather in the Lake country in early autumn, when tourists mostly come here, as compared with spring and early summer.

JOHN MARSHALL.

*Derwent Island, Keswick.*

LOW BAROMETER, OCTOBER 13<sup>TH</sup>, 14<sup>TH</sup>, 1891.

